

## PATENT COOPERATION TREATY

PCT

REC'D 06 JUN 2006
WFO
PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 183.43731A00	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US05/11292	International filing date (day/month/year) 01 April 2005 (01.04.2005)	Priority date (day/month/year) 01 April 2004 (01.04.2004)
International Patent Classification (IPC) or national classification and IPC IPC: A61F 2/66( 2006.01) USPC: 623/38		
Applicant TOWNSEND, BARRY, W.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the report
- II  Priority
- III  Non-establishment of report with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand 16 February 2006 (16.02.2006)	Date of completion of this report 26 April 2006 (26.04.2006)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/ US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer  Javier S. Blanco Telephone No. 571-272-4747

**I. Basis of the report**

## 1. With regard to the elements of the international application:\*

the international application as originally filed.

the description:  
pages 1-39 as originally filed  
pages None, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

the claims:  
pages 41, 44 as originally filed  
pages NONE, as amended (together with any statement) under Article 19  
pages 40, 42 and 43, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

the drawings:  
pages 1-30, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

the sequence listing part of the description:  
pages NONE, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

the language of publication of the international application (under Rule 48.3(b)).

the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

contained in the international application in printed form.

filed together with the international application in computer readable form.

furnished subsequently to this Authority in written form.

furnished subsequently to this Authority in computer readable form.

The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4.  The amendments have resulted in the cancellation of:

the description, pages NONE

the claims, Nos. NONE

the drawings, sheets/fig NONE

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/US05/11292

## V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. STATEMENT

Novelty (N)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO

## 2. CITATIONS AND EXPLANATIONS

1. Claims 1-30 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a method of generating kinetic power for propulsive force in a resilient lower extremity prosthesis, which method comprises the step of: (i) expanding at least two sagittal plane concavities of said resilient prosthesis during force loading of the prosthesis in the active propulsion phase of a person's gait to store energy in the prosthesis; (ii) releasing said stored energy in the later stages of stance-phase of gait to add to the propulsion of the trailing limb and person's body; wherein during said force loading of the prosthesis in the active propulsion phase of gait storing additional energy in an artificial muscle provided on at least one of the foot, ankle, and shank of the prosthesis and in said later stages of stance-phase in gait, releasing said additional energy to further add to the propulsion of the person's trailing limb and body.

2. Claims 1-30 meet the criteria set out in PCT Article 33(4), and thus claims 1-30 provide industrial applicability because the subject matter claimed can be made or used in industry.

CLAIMS

1. (amended) A method of generating kinetic power for propulsive force in a resilient lower extremity prosthesis including a resilient foot, a resilient ankle and an elongated, upstanding, resilient shank above the ankle, the method comprising:

expanding at least two sagittal plane concavities of the resilient prosthesis during force loading of the prosthesis in the active propulsion phase of a person's gait to store energy in the prosthesis;

releasing said stored energy in the later stages of stance-phase of gait to add to the propulsion of the trailing limb and person's body;

wherein during said force loading of the prosthesis in the active propulsion phase of gait storing additional energy in an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis and in said later stages of stance-phase in gait, releasing said additional energy to further add to the propulsion of the person's trailing limb and body.

2. (amended) The method according to claim 1, wherein said expanding includes expanding a concavity formed by an upwardly arched midfoot of said resilient foot.

3. (amended) The method according to claim 1, wherein said expanding includes expanding a posterior facing concavity of said resilient shank.

4. The method according to claim 1, wherein a monolithically formed resilient member of said prosthesis forms said ankle and said shank, and wherein said expanding includes expanding a concavity formed by an anterior facing convexly curved portion of said resilient member.

5. The method according to claim 1, wherein said storing additional energy in an artificial muscle includes tensioning a viscoelastic material provided on at least one of the foot, ankle and shank of the prosthesis.

14. The method according to claim 1, including forming said artificial muscle using a viscoelastic material selected from the group consisting of rubber and polymer.
15. The method according to claim 1, further comprising during said force loading of the prosthesis detecting a force exerted by the prosthesis and adjusting the energy storage capacity of said artificial muscle during said force loading as a function of the detected force.
16. The method according to claim 1, including preloading the artificial muscle in tension prior to said force loading in gait to increase the potential energy of the prosthesis.
17. (amended) A resilient lower extremity prosthesis comprising:
  - a foot extending in a longitudinal direction;
  - a resilient ankle;
  - an elongated, upstanding, resilient shank above the ankle;
  - wherein the ankle and shank are formed as a resilient member, the shank extending upward in a substantially curvilinear manner above the ankle and flexing in the longitudinal direction during gait for storing and releasing energy to improve dynamic response of the prosthesis in gait;
  - an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis for storing energy during force loading of the prosthesis in the active propulsion phase of a person's gait and in the later stages of stance-phase of gait releasing said energy to aid propulsion of the person's trailing limb and body.
18. The prosthesis according to claim 17, wherein said artificial muscle is preloaded in tension to increase the potential energy of the prosthesis.
19. The prosthesis according to claim 17, further comprising means for adjusting the energy storage capacity of the prosthesis by adjustably preloading the artificial muscle in tension.
20. The prosthesis according to claim 19, wherein said means for adjusting is selected from the group consisting of a cam, a pad and a bladder containing pressurized fluid.

21. The prosthesis according to claim 17, including an artificial muscle on the foot of the prosthesis.
22. The prosthesis according to claim 21, wherein the foot includes a foot keel and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot keel.
23. The prosthesis according to claim 21, wherein the foot includes a foot shell over the lower extremity of the prosthesis and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot shell.
24. The prosthesis according to claim 17, wherein said artificial muscle extends between and connects the prosthesis and a socket on a leg stump of a person's body when the prosthesis is in use.
25. (amended) The prosthesis according to claim 17, wherein said resilient member is a monolithically formed member which at least in the area of the ankle is anterior facing convexly curved.
26. The prosthesis according to claim 25, wherein said artificial muscle is provided on said resilient member.
27. The prosthesis according to claim 26, wherein an artificial muscle is also provided on said foot.
28. The prosthesis according to claim 17, wherein said artificial muscle is formed at least in part of a vascoelastic material selected from the group consisting of rubber and polymer.
29. The prosthesis according to claim 17, further comprising a detector for detecting a force exerted by the prosthesis during said force loading of the